

Insects free - bio

Entomology Research Branch
P. O. Box 232, Kerrville, Texas

April 13, 1956

AIRMAIL

To: A. W. Lindquist, Head, Section of Insects Affecting
Man and Animals

From: R. C. Bushland, Entomologist in Charge

Subject: Preliminary Statement of Methods and Costs of a Screw-worm
Eradication Program.

I read your letter of April 6 with great interest and Mr. Poeske and I reviewed your tentative budget. In so far as I understand the presentation, I am in general agreement with your outline. In the following paragraphs I will attempt to answer the specific questions you raised in your letter and point out where I disagree with the proposals in the accompanying budget.

Considering the question in your first paragraph as to whether funds are adequate, I believe they are. Where costs may be underestimated in some places, they should be compensated for by savings that will develop in other lines.

We will first discuss air distribution of sterilized flies with a budget which you said you cut arbitrarily to \$665,000.00. On page 5 of your budget discussion you mention 60 sectors with one airplane covering each sector twice a week, flying 10 hours per day. On page 13 you mention 30 airplanes to cover the 60 sectors. Since the plane could fly only in daylight, it would seem you would need an airplane for each sector, as indicated on page 5.

Considering the swath width, what we had on Curacao was a mile swath at each flight with the flight lanes moved 0.5 mile on alternate flights so that in actual practice the weekly flight lanes were 1/2 mile apart. I think that this principle should be utilized for the Florida project. If you fly 1.5-mi. swaths and move the swaths 0.5 mi. each successive flight, you will still end up with the flies being

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distributed in lanes 0.5 mile apart. Of course, the frequency of flying over an area would have to be sufficient so that males put out on the first flight would still be alive when the third flight is made. Our general experience in the Kerrville sterilization work was that the LD-50 for longevity of irradiated males averaged about 12 days. Thus, if males of that vigor are distributed at 4-day intervals, one-half the males distributed on the first flight would still be alive to complete the 0.5-mile pattern when the series is repeated. (I do not mean by the above to suggest that the males will remain where dropped in the flight lanes. We know from our experience on Curacao that they distribute themselves with satisfactory uniformity over 0.5-mi. swaths.)

From my review of Mr. Baumhover's work on developing a "super" strain of flies, he is observing much greater longevity in his current series of cage tests than we noted in our earlier work at Kerrville. Baumhover's observations are on untreated insects and we know that the sterilized flies do not live as long, but I still think that Baumhover will have developed a strain which is considerably longer lived than the Texas strain which we released on Curacao.

Also, on Curacao we released the insects to encounter relatively adverse conditions. There were no fresh water ponds, lakes, or running streams, and I believe that we must have lost a large proportion of our insects through desiccation. I believe that flies dropped over Florida will find it much easier to obtain food and water. This adds to our expectations of higher initial survival and greater longevity of released insects.

I would rather not deviate from operational practices that were successful on Curacao, but if we must reduce the budget in order to have an acceptable program, then I think you can safely estimate on flying 1.5-mi. swaths at 5-day intervals, moving the flight lanes 0.5 mile and thus repeating the flight patterns at 15-day intervals.

I am in disagreement with the item concerning the transportation of pupae from Texas to Florida. The twice-weekly shipment of pupae will not be good if the insects are sterilized in Texas. To tolerate the lethal effects of irradiation the insects must be at least 5 days old (aged at $80^{\circ} \pm 2^{\circ}$ F.) when irradiated. Actually, they can withstand irradiation better on the sixth day, but that did not allow sufficient time for shipment, so for the Curacao experiment we treated on the fifth day. When held at 80° F. and irradiated at 5 days $\pm$ 6 hours, flies emerged beginning just a little past 48 hours after irradiation.

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If you were going to ship twice a week, the insects would still have to be aged at 80° in order for the fifth-day irradiation to come at the proper stage of pupal development. Subsequent development and emergence could be retarded by holding the insects at a reduced temperature after irradiation, but that is a point that would require more research before it is put into practice. I would rather plan on shipping insects every other day. By so doing no pupae would need to be more than about 30 hours past the sterilization time and hence shipped at least 20 hours before emergence. This should allow ample time for the oldest pupae to reach the fly receiving center at Orlando before emergence.

You could ship young pupae to Florida and irradiate them at Orlando, but this would be complicated because their development should be at a rather precise stage when the irradiation is done and fluctuating temperatures in transit would require some sort of constant temperature packaging. Also there would be the risk of normal flies escaping if a shipment of untreated pupae should be involved in an accident.

This modification
I made some further calculations on the shipping weight of pupae. In order to ship 50 million-males per week we should send 100 million pupae, allowing for a 50-50 sex ratio and estimating no mortality in the pupal stage. The 100 million pupae would weigh about 22,000 pounds. Twenty-two thousand pounds of pupae packed in emergence containers might make a load of about double that weight, or 44,000 pounds each week to be sent in shipments spaced 48 hours apart, or a load of 12,600 pounds every 2 days.

Mr. Poeske and I checked with Slick Airways, which I believe is the largest air freight company in the United States. A company official told me that such a load was ideally suited to one of their C-46 airplanes, since a C-46 hauled a payload of 13,500 pounds. Slick's charter rate for a C-46 airplane is 92¢ per mile one way. Assuming an air distance of 1,000 miles from San Antonio to Orlando would mean a cost of \$920.00 per trip for hauling pupae. At 182 trips per year, the estimated cost would be \$167,440.00. The Slick Airway official told me that they would be pleased to bid for such a contract and that we could be assured that their bid would not exceed 92¢ per mile. Therefore, I think you would be quite safe in changing your air shipment estimate from that given on page 13.

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Over the telephone you asked me to check on cold storage facilities, so Mr. Poeske had a very thorough discussion with the manager of the cold storage division of Seobey's Fireproof Storage Co. That company, without additional construction, could easily provide storage facilities for 100,000 pounds of meat. They presently store large quantities of meat for the major meat packing companies in San Antonio. Their published rate for beef in lots of 15,000 pounds or more is 30¢ per cwt. for the first month and 17¢ for each additional month. Thus, if you were moving meat in and out each month, the rate would be \$3,000.00 per month, or \$36,000 per year. However, if for insurance of supply you put 100,000 pounds in storage and left it there for a year, the rate for the first month would be \$3,000.00 and it would be only \$1,700.00 each succeeding month, or a total of \$21,700.00 per year. This is their published commercial rate.

I think that the above amounts cover the points you asked me to handle. In addition I wish to urge that you and Dr. Knipling give more consideration to making the first releases in south Florida rather than north Florida. As you indicated in the next to the last paragraph of your letter, releases in north Florida would be of questionable value if a mild winter allowed the flies to survive in Georgia and hence subject the first-treated area to infiltration from two sides. Another factor is that releases in north Florida would be wasted if we should be so lucky as to have cold weather cause a winter kill of flies over the northern part of the State.

On the other hand, releases over south Florida could not help but result beneficially. I would favor making the first releases over the Florida Keys and the area south of Lake Okeechobee, where we could be fairly sure of getting eradication with a small number of flies. Then as we went on into the winter and production increased, the whole southern half of Florida might be treated with the assurance that temperatures would be warm enough almost every day so that the flies could disperse and mate normally with the wild insects. I am afraid that about half of the flies released in the Ocala-Gainesville area in the wintertime might be wasted because of adverse weather conditions. Such losses would have to be taken to complete a control campaign with the consoling thought that when cold weather killed our released insects it should also kill the native screw-worms. However, I would not feel good over releasing our first sterilized screw-worm flies to be killed by cold weather in north Florida while native flies survived in the mild climate in an untreated southern part of the State.

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I will not attempt a criticism of the personnel requirements you outlined on page 11. However, I would like to point out that I do not fully understand your outline. If such an outline is to be given, some sort of an explanatory phrase should follow the GS designations so that a reviewer would have an idea of the sort of job involved. For example, I know from previous conversations that it is planned that Mr. Bruce would be the GS-14 entomologist in charge of the program. As the GS-13 assistant do you plan to have an entomologist, engineer, or pilot? If an entomologist would he be a medical entomologist or a plant pest control man? I presume that all the personnel GS-7 to GS-12 listed under Item "d" are entomologists. Under Item "b" you specify two GS-9 entomologists and their jobs, but you list one GS-12, two GS-11's, and eight GS-7's with no designation. I assume that the GS-7's are the entomologists referred to in the second paragraph of your letter of transmittal. But are the 11's and 12's entomologists or pilots? I suppose that your survey personnel are all entomologists. Under Item "d" I assume that the GS-12 administrative officer would be in Mr. Bruce's office in Florida. Don't you think there should be a GS-11 (I am thinking of Mr. Poeske) administrative assistant in charge of all fiscal affairs at the Texas fly production center?

I will be pleased to read the comments that come from the Orlando laboratory. You did not ask Mr. Eddy for any comments, but I hope that he volunteers on the basis of the information copy of the letter you sent him. I will be happy to go into more detailed correspondence concerning this plan if time permits a further exchange of letters.

In triplicate

cc: C.L.Smith
G.W.Eddy

RCBushland:mb

I will not attempt a criticism of the personnel requirements you outlined on page 11. However, I would like to point out that I do not fully understand your outline. If such an outline is to be given, some sort of an explanatory phrase should follow the OS designation so that a reader would have an idea of the sort of job involved. For example, I know from previous conversations that it is planned that the OS-12 would be the OS-12 entomologist in charge of the program. As the OS-12 assistant do you plan to have an entomologist, engineer, or pilot? If an entomologist would be a medical entomologist or a plant pest control man? I presume that all the personnel OS-7 to OS-12 listed under Item "B" are entomologists. Under Item "C" you specify two OS-9 entomologists and their jobs, but you list one OS-12, two OS-11's, and eight OS-7's with no designation. I assume that the OS-7's are the entomologists referred to in the second paragraph of your letter of transmittal. But are the 11's and 12's entomologists or pilots? I suppose that your survey personnel are all entomologists. Under Item "D" I assume that the OS-12 administrative officer would be in Mr. Brown's office in Florida. Don't you think there should be a OS-11 (I am thinking of Mr. Brown) administrative assistant in charge of all fiscal affairs at the Texas City production center?

I will be pleased to read the comments that come from the Orlando Laboratory. You did not ask Mr. Raby for any comments, but I hope that he volunteers on the basis of the information copy of the letter you sent him. I will be happy to go into more detailed correspondence concerning this plan if time permits a further exchange of letters.

In tribute

cc: C.L. Smith
D.W. Raby

HGB:land:mb

PRELIMINARY STATEMENT ON METHODS AND ESTIMATES OF COSTS
FOR SCREW-WORM ERADICATION PROGRAM IN FLORIDA

Prepared by Entomology Research Branch, April 6, 1956

The successful eradication of the screw-worm from the island of Curacao in 1954 by the systematic release of sterile males stimulated interest in use of the same method for the possible elimination of the pest in the southeastern states. In order to determine if a similar program would be practical in the Southeast, Congress increased current funds by \$40,000 and the State of Florida contributed \$25,000 to intensify research to this end. This expanded research has been under way since July 1955 and although good progress has been made, answers have not been obtained on all the problems involving a large-scale eradication effort.

During the past several months research has been directed to the development of improved and lower cost medium for rearing the

screw-worms, devising economical methods of rearing millions of strong, disease free flies every week and developing an artificial attractant for screw-worm flies to be used in estimating natural populations.

The finding that screw-worms grow well on beef hearts and that there are available sufficient tonnages at a price of approximately 15 cents per pound has reduced original estimates considerably. Techniques of rearing the approximately 50 million larvae that will be needed per week are still in the developmental stage and estimates of costs of equipment and buildings needed are subject to a great deal of fluctuation.

Plan

The Entomology Research Branch had planned on preparing in December 1956 a detailed statement of the practicability of an eradication program together with detailed estimates of facilities, personnel, and costs. It was believed that the research would have

progressed sufficiently during the next several months so that accurate plans could be developed and sound cost estimates proposed. Since the estimates presented herewith are preceding the gathering of basic information they must be considered tentative and subject to revision. Another point to consider is that the proposed large scale project is a new venture and does not have accumulated experience such as exists with grasshopper control and other programs.

Because a large especially designed building needs to be constructed to house rearing of screw-worms and the assembling of equipment and personnel, approximately 10 months will be required before the actual release of flies can get under way. Under present slow moving procurement procedures it will not be possible to get the program started in less than the time indicated. Approximately \$1,400,000 will therefore be required the first year to construct

the building, obtain supplies, trucks, and recruit and train personnel.

Of this amount the non-recurring cost would be approximately \$1,003,500.

The second year's program would require a total of approximately \$2,293,415 for a complete roster of personnel, labor, medium, and contract airplanes to disperse the flies. The 2 years therefore would total \$3,693,415 for expenditures. In order to assure success it is mandatory that provision be made for continuing the program the third year requiring another \$2,293,415. The total funds needed therefore to carry out the program to conclusion would be approximately \$5,986,830. This does not take into account livestock inspection and quarantine of shipments from the West.

The present plan calls for release to start in September and continue throughout the winter and spring. As the season develops the number of flies released in North Florida will be increased and releases will extend 50 to 100 miles in advance (north) of the known overwintering line.

Dispersal of Flies

Personnel of the Aircraft and Special Equipment Center of the Plant Pest Control Branch have been consulted regarding the problems of dispersal of the flies.

Florida has been divided into 60 sectors, each approximately 9 miles wide and 75 miles long. One airplane can cover a sector twice a week by flying 10 hours per day. Flying time per plane will be divided between two pilots with an estimate of one hour ferrying to each five hours of flight over the target areas. The swath widths used in Curacao will be widened from one mile apart to 1-1/2 miles in order to reduce costs. A swath width of three or more miles could possibly be used but it is not known if the released males will disseminate and uniformly cover the larger area. Obviously larger swath widths would result in lower costs since fewer planes and pilots would be needed but without more information the risk of

incomplete coverage is too great to justify incorporating it into the program. It is proposed to release flies on a twice a week basis.

The type of containers in which the flies will be dropped from the planes have not been finally selected. The type selected will depend on the automatic dropping devices developed for use in the planes. In the Curacao experiment the containers were manually dropped through a chute by a man riding with the pilot. In a large operation, automatic dropping equipment must be developed as well as containers that automatically open in the air or when hitting the ground. The aircraft development group has had an immense amount of experience along these lines and they foresee no real difficulties in developing the equipment needed.

The cost of shipping pupae from the fly hatchery in Texas to Florida appears excessive but the risk of only a pair of fertile flies escaping in Florida is too great to consider any other course.

The safeguards needed to prevent escapes plus the sterilization of spent media which always harbor a few larvae would cost a great deal more than \$200,000.

Larval Rearing

Estimates on the size and cost of rearing facilities are far from accurate at this time. A total of 50,000 square foot of floor space will be needed but we cannot be certain until the pilot fly hatchery in Orlando has been equipped and tested. It is not known if a two-story or a single floor plan would be best suited to rearing. Engineering assistance on the building and suggest "flow plans" of material into and out of the building has been promised by the Chemical Corps Biological Laboratories. It is hoped that in about three months the engineers' suggestions and plans will be available.

It has been suggested that abandoned military buildings might

be obtained to house the rearing setup. An airplane hangar building, for example, might be a good place in which to build the insulated rooms needed. Concrete floors and roof would already be in place and the cost of building insulated rooms would thereby be reduced considerably.

The cost of installing heating, deodorizing, cleaning, grinding and mixing equipment, as well as racks, trays, cages, and other devices needed for handling the millions of insects is roughly estimated at \$300,000. At this time the equipment needs and costs of a large operation are unknown but it is believed the amount specified will cover the needs.

The rearing facilities will be set up in Texas in order to minimize the risk of flies escaping and reinfesting the area in Florida. The headquarters should be near a large city and mainline railway. The nearer to a large meat packing plant and a labor supply the better. Carload lots of beef hearts would be shipped from

Chicago, Kansas City, and other places to a commercial cold storage plant in a city like San Antonio or Houston. In addition some cold storage facilities might have to be constructed adjacent to the rearing facilities so as to have an emergency reserve on hand.

The larval rearing would be a more or less continuous process. Pupae would be irradiated in Cobalt sources similar to the unit now available but of a larger size. Measuring the pupae into the 200,000 packages required each week would be done by machines yet to be developed.

The small containers (approximately 3 x 2 x 3 inches) would be packaged in suitable cardboard boxes for shipment to the distribution center in Florida. The weekly volume of boxes may be approximately 3,000 cubic feet.

The small dispersal containers holding the pupae will be spread out on shelves in air-conditioned rooms at the aircraft center in Orlando, Florida, till emergence of flies is complete and they are ready for

distribution by trucks to the airfields from which releases will be made. A simple rapid means of providing water for the flies remains to be developed.

The function of the survey personnel will be to educate stockmen and others to prevent screw-worm cases during the program so as to reduce the native population as much as possible. The lower the native population the better the chances of eradication. They will also keep in close contact with livestock auctions so as to prevent shipping of infested livestock into or out of the control area. The third important job of the survey personnel will be to measure the native population of flies by means of an artificial attractant which is in the developmental stage. It is highly important to know the incidence of native flies before and during the release program.

Estimated Costs of Screw-Worm Program

	<u>Annual costs except on capital equipment</u>
1. Supervisory personnel and space	
1 GS-14 in charge of entire program	\$10,320
1 GS-13 assistant	8,990
a. Rearing, fly maintenance, and sterilization personnel to be stationed at rearing headquarters	
1 GS-12	7,570
1 GS-11	6,390
6 GS-9's	32,640
4 GS-7's	18,100
b. Aerial dispersion	
1 GS-12	7,570
2 GS-11's	12,780
8 GS-7's	36,200
2 GS-9 entomologists at aircraft center for handling flies	10,880
c. Survey and coordination of release schedules	
1 GS-12	7,570
2 GS-9's	10,880
d. Clerical and fiscal	
1 GS-12 administrative officer	7,570
2 GS-9 assistants	10,880
1 GS-5 stenographer	3,670
3 GS-4 clerk-typists	10,245

Estimated Costs of Screw-Worm Program

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capital equipment

1. Supervisory personnel and space	
1 GS-14 in charge of entire program	\$10,320
1 GS-13 assistant	8,990
a. Rearing, fly maintenance, and sterilization personnel to be stationed at rearing headquarters	
1 GS-12	7,270
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2 GS-9 assistants	10,880
1 GS-5 stenographer	3,670
3 GS-4 clerk-typists	10,245

e.	Quarters for Florida personnel, rental annually	\$25,000
f.	For Florida personnel	
	3 passenger cars	4,000
	1 truck	1,100
g.	Travel, misc. supplies for Florida personnel	<u>10,000</u>
		\$242,355

2. Larval rearing

a.	Building, 50,000 sq. ft.	\$500,000
b.	Equipment, heating and cooling, deodorizing, mixers, grinders, conveyors, racks, trays, sacking devices, washing and cleaning equipment	300,000
c.	Media (meat, blood, etc.) 50,000,000 flies per wk. production Beef heart instead of lean meat reduces cost 63%. 1,000 larvae = 25¢ or \$12,500/wk.	650,000
d.	Labor for rearing These are rough estimates based on current information. 100 men @ \$50/wk.	260,000
e.	Fly maintenance and sterilization equipment Cobalt sterilizing units Laborers for fly maintenance 5 @ \$50/wk.	90,000 13,000
f.	Disposal system for spent media	50,000
g.	Cold storage facilities for reserve supply of meat & blood (100 tons) rental per yr.	15,000

e.	Quarters for Florida personnel, rental annually	\$25,000
f.	For Florida personnel	
	3 passenger cars	4,000
	1 truck	1,100
g.	Travel, misc. supplies for Florida personnel	<u>10,000</u>
		\$242,322

2. Larval rearing

a.	Building, 50,000 sq. ft.	\$500,000
b.	Equipment, heating and cooling, deodorizing, mixers, grinders, conveyors, racks, trays, sacking devices, washing and cleaning equipment	300,000
c.	Media (meat, blood, etc.) 50,000,000 flies per wk. production Beef heart instead of lean meat reduces cost 63%. 1,000 larvae = 25¢ or \$12,500/wk.	650,000
d.	Labor for rearing These are rough estimates based on current information. 100 men @ \$50/wk.	250,000
e.	fly maintenance and sterilization equipment	
	Cobalt sterilizing units	90,000
	Laborers for fly maintenance 2 @ \$50/wk.	13,000
f.	Disposal system for spent media	50,000
g.	Cold storage facilities for reserve supply of meat & blood (100 tons) rental per yr.	15,000

h. 4 2-ton trucks for hauling meat from cold storage to fly hatchery \$10,000

4 pickup trucks @ \$1,100 each 4,400

\$1,892,440

3. Fly dispersal

a. Contracting of airplanes
30 small aircraft @ \$10 per hr.
to cover 60 sectors, estimated
50,000 acres 655,000

b. Automatic dispersal devices in
each plane 12,000

c. Dispersal containers
4 containers/sq. mi./wk. =
10½ million/yr. @ 1 cent each 105,000

d. Rental of holding room for flies at
aircraft center, 30' x 30' room 1,000

Air-conditioners 2,000

e. Air shipment of pupae from fly hatchery
in Texas to Florida by contract,
approx. 1500 cu. ft. twice wkly. 200,000

f. 4 trucks for distribution from
Florida center to 7 airfields 10,000

g. 4 truck drivers 12,000 997,000

4. Field survey personnel

20 survey personnel @ \$5,440
(1 man for 3 counties) 108,800

Trucks for survey personnel
20 @ \$1,100 22,000

Gas, oil, and upkeep of trucks, \$300/wk. 15,600

Per diem 2 days/wk/man @ \$9/day 18,720

165,120

Total \$3,296,915

\$3,286,912	Total	<u>162,120</u>	<u>18,720</u>	Per diem 2 days/wk/man @ \$9/day	Gas, oil, and upkeep of trucks, \$300/wk.	12,600	22,000	Trucks for survey personnel 20 @ \$1,100	30 survey personnel @ \$2,440 (1 man for 3 counties)	4. Field survey personnel	g. 4 truck drivers	<u>12,000</u>	997,000	Florida center to 7 airfields	f. 4 trucks for distribution from	10,000	approx. 1500 cu. ft. twice wky.	e. Air shipment of pupae from fly hatchery in Texas to Florida by contract.	Air-conditioners	2,000	aircraft center, 30' x 30' room	d. Rental of holding room for flies at	1,000	10 1/2 million/yr. @ 1 cent each	4 containers/sp. mi./wk. =	102,000	Dispersal containers	Automatic dispersal devices in	12,000	50,000 acres	to cover 60 sectors, estimated	652,000	30 small aircraft @ \$10 per hr.	Contracting of airplanes	3. Fly dispersal	\$1,892,440	4 pickup trucks @ \$1,100 each	<u>4,400</u>	cold storage to fly hatchery	\$10,000	h. 4 2-ton trucks for hauling meat from
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Livestock Flies
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Entomology Research Branch
P. O. Box 232, Kerrville, Texas

January 3, 1956

AIRMAIL

To: A. W. Lindquist, Head, Insects Affecting Man and
Animals Section

From: R. C. Bushland, Kerrville, Texas

Subject: Estimates for Cost of Screw-worm Eradication

In response to your letter of December 27 asking that I work up a preliminary budget for the proposed eradication program, I offer the following figures. These are based on conversations with Messrs. Poeske and Hopkins and a study of estimates offered by Mr. Baumhover in his letter to you of last January 20 and some figures that Mr. Graham worked up for the First Quarterly Report for 1955.

Fly Dispersal: Peninsular Florida has an area of approximately 80,000 square miles. To fly 1-mile swaths twice weekly as was done for the Curacao experiment would require flying 100,000 linear miles per week. Assuming a cruising speed of 100 m.p.h., it would require 1,000 hours actual flying time to disperse the flies. We estimate an equal amount of flying time might be spent in take-offs, landings, and in transit between the airports and release areas. On a contract basis, airplane rental for 100 m.p.h. light planes might be about \$12.00 per hour. It is assumed that the flies would be released mechanically without the need of a man to accompany the pilot and tear open sacks as was done on Curacao. The cost of dispersing the flies would be \$24,000.00 per week.

Larval Rearing: To release flies at the rate of 400 sterile males per square mile per week it would be necessary to rear them at the rate of 500 males (plus an equal number of females) to compensate for mortality and to supply a surplus for breeding stock. This would mean production of 50,000,000 flies per week. Figuring on the standard rearing medium with meat costing \$0.40 per pound (current price for ground beef \$0.39) and blood at \$0.015 per pound, it would cost \$0.53 to rear 1,000 insects to the pupal stage. Rearing 50,000,000 weekly would thus cost \$26,500.00.

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Adult Maintenance: In order to rear 50,000,000 flies per week we would need to maintain and replace each week a stock colony of 600,000 flies kept in 3,000 cages. Cost of keeping cages in repair and feeding the flies is estimated at 20¢ per cage, or \$600.00 per week.

Rearing Labor: Messrs. Baumhover and Graham made some time estimates last spring which in summary mean that approximately 1-man hour of labor is needed to produce 5,000 flies (this figure does not include the labor of packing sterilized pupae in the release sacks as was done for Curacao). Considering that 50,000,000 insects are to be reared each week, 10,000 man hours would be required to follow the procedures that were used in rearing flies for the Curacao project. Assuming an average labor cost of \$2.00 per hour, it would cost \$20,000.00 per week for the insectary labor to produce the sterilized flies.

Field Survey: In order to estimate populations of screw-worms and appraise the effects of releasing sterilized flies, it would be necessary to keep a crew of 12 men in the field collecting egg masses and computing percent hatch. Expenses of maintaining the field work are estimated at \$2,400.00 per week.

Sterilization Equipment: Cobalt-60 gamma ray sources like the one now installed at Orlando can be built for \$4,500.00 each. Twenty such sources would be adequate to sterilize 40,000,000 flies per week with 7,500 r of gamma rays. Thus the sterilization equipment would be one of the least expensive items, amounting to \$90,000.00.

Insectary Buildings: To produce flies for the Curacao project insectary space of approximately 400 square feet was crowded to the utmost. Since the anticipated Florida project is 300 times as big and all we have to go on now is our past experience, I estimate 300 times the space requirements, or 120,000 square feet. Fully equipped with the necessary air conditioning, rearing cabinets, washing and cleaning facilities, the buildings would cost at least \$10.00 per square foot, or a total of \$1,200,000.

Considering operations a full 52 weeks out of the year, expenses the first year would be as follows:

Adult Maintenance: In order to have 50,000,000 lines per week we would need to maintain and replace each with a whole colony of 500,000 lines per week in 5,000 cages. Cost of keeping cages in repair and feeding the flies is estimated at 20¢ per cage, or 10,000,000 per week.

Feeding Labor: Messrs. Henthorn and Graham make some time estimates that suggest which is necessary when that approximately 1 man hour of labor is needed to produce 5,000 flies (this figure does not include the labor of feeding sterilized cages in the various cages as was done for German). Assuming that 50,000,000 flies are to be raised each week, 10,000 men hours would be required to follow the procedures that were used in raising flies for the German project. Assuming an average labor cost of \$3.00 per hour, it would cost \$30,000,000 per week for the necessary labor to produce the sterilized flies.

Field Survey: In order to maintain population of mosquitoes and parasites the release of releasing sterilized flies, it would be necessary to have a crew of 10 men in the field collecting and releasing and keep them housed. Expenses of maintaining the field work are estimated at \$5,000,000 per week.

Specialized Equipment: Specialized equipment for the project is estimated at \$10,000,000 per week for the first 50 weeks. This is estimated at \$5,000,000 per week for the first 50 weeks. This is estimated at \$5,000,000 per week for the first 50 weeks. This is estimated at \$5,000,000 per week for the first 50 weeks.

Specialized Facilities: The project flies for the German project necessary space of approximately 400 square feet was needed for the project. This specialized facility project is 500 square feet and all we have to do is now to get the necessary equipment, I estimate 500 flies per square foot, or 150,000 square feet. Fully equipped with the necessary air conditioning, heating, lighting, washing and cleaning facilities, the building would cost at least \$10,000 per square foot, or a total of \$1,500,000.

Specialized Operations: A total 50 weeks end of the year, expenses the flies per week would be as follows:

S-A.W. Lindquist-1/3/58

Fly dispersal	52 weeks @ \$24,000.00	\$1,248,000.00
Larval rearing	52 " @ \$26,500.00	1,378,000.00
Adult maintenance	52 " 600.00	31,200.00
Field survey	52 " 2,400.00	124,800.00
Sterilization equipment		90,000.00
Insectary buildings		1,200,000.00
		<u>\$8,112,000.00</u>

5,112,000.00

I recognize that the first year we could not run full-scale for 52 weeks, as several months would be required to recruit and train a staff while the buildings and equipment were being set up. However, I did not figure on any excess as a margin of safety, so it might be well to assume 52 weeks full-scale operations in order to have a reserve. I assume that the project would be set up on a continuing basis to run 2 years. For the second year we could estimate full-scale operations for 52 weeks, or a labor and supply cost of \$3,822,000.00. The total cost for a 2-year eradication program is thus \$8,934,000.00.

In previous conversations concerning this project you stated that the control people would work out the details of distributing the sterilized flies. The above costs do not include the very expensive procedure of putting up sterilized pupae at the rate of 120 per sack as was done for Curacao. I am sure that some much less laborious procedure can be devised. Some additional estimate should be made for the step which involves handling the insects between the time the pupae are removed from the gamma ray source to the time the adults are released in the field.

Neither has any estimate been made for acquisition of automobiles or trucks.

In figuring labor costs we estimated rates as high as GS-11 for men in charge of insectaries and survey crews, but made no estimates for higher administrative overhead, such as project supervisors, administrative assistants, stenographers, etc.

In triplicate

cc: C.L. Smith

RCBushland:mb

Photographs of
F. b. l. s.

Specifications for the meat
storage of meat. [n.d.]

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The composition of the rearing medium was as follows:

CM

Ground lean meat	8 parts
Tap water	7 parts
Citrated beef blood	4 parts
Formalin	0.17%

It was found that as long as the meat was lean and finely ground it did not matter whether beef, horsemeat, beef hearts or pig hearts were used. Meat requirements averaged 1.5 lbs. of meat per 1,000 pupae. Estimating the cost of ground heart at \$0.25 and ground beef (or horsemeat at \$0.35 per pound) and citrated blood at \$0.015 per pound delivered to the laboratory, the pupae cost about \$0.39 per thousand for raw materials when reared on ground heart.

Rearing 50,000,000 pupae per week at 0.39 per thousand would mean an expenditure of \$19,500 weekly for the 75,000 lbs of ground heart, 37,500 lbs. of blood and 350 lbs of formalin required.

Comparative records were kept on the amount of entomological labor required for mass rearing when pupae were produced at the rate of 1,000,000 per week by two methods. Rearing larvae in 17" x 26" bun trays in heated cabinets required the expenditure of 120 man hours per million pupae. Rearing the same number in "pool tables" measuring 10' x 4'6" x 1 1/4" required only 40 man hours per million pupae. For both methods time was kept on the actual work of rearing and does not include administrative, clerical, or janitorial services which would be about the same for either procedure. Estimating a skilled technicians wage at \$2.00 per hour gives a labor cost of 0.08 per thousand pupae by the pool table method against 0.24 per thousand by the tray method.

